Soeharso Orthopaedic Journal

Type Original Article
Published 02 November 2026
ISSN 3124-3495

Spectrum of Musculoskeletal Disorders in a Rural Indonesian Hospital: Implications for Orthopedic Service Planning

OPEN ACCESS

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Received 15 June 2026
Accepted 30 October 2026
Published 02 November 2026

CITATION
Fathur Rahman, & Wati, W. (2026). Spectrum of Musculoskeletal Disorders in a Rural Indonesian Hospital: Implications for Orthopedic Service Planning. Soeharso Orthopaedic Journal, 1(2). 52-63
https://doi.org/10.65745/soj.v1.i2.24

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ABSTRACT

The uneven distribution of orthopedic specialists in Indonesia contributes to disparities in musculoskeletal healthcare, particularly in rural areas. Limited healthcare resources and specialist availability may increase referrals to higher-level facilities. This study aimed to describe the spectrum of musculoskeletal disorders at RS Pratama Mayapuria, North Morowali, Indonesia, and explore their implications for orthopedic service planning. A retrospective descriptive study was conducted using medical records from January 2024 to December 2025. Patient demographics, clinical diagnoses, anatomical locations, disease etiologies, and referral status were analyzed using descriptive statistics. A total of 483 patients were included, of whom 71.2% were female and 50.5% were aged 60 years or older. Osteoarthritis (48.2%) and low back pain (24.2%) were the most common diagnoses, predominantly involving the knee and spine. Non-traumatic conditions accounted for 79.9% of cases, while 38.1% of patients were referred to higher-level healthcare facilities. These findings indicate a substantial burden of degenerative and other non-traumatic musculoskeletal conditions and a considerable proportion of referrals in this rural hospital. The observed disease patterns may inform local orthopedic service planning, particularly the development of conservative management and rehabilitation services, alongside essential trauma stabilization capabilities. Strengthening these services may improve access to musculoskeletal care and reduce potentially avoidable referrals, although further assessment of referral indications, healthcare resources, and service capacity is needed to determine specific priorities.

KEYWORDS
Musculoskeletal disorders; Orthopedic referral; Remote healthcare

INTRODUCTION

The global burden of musculoskeletal disorders (MSDs) continues to show a worrying escalating trajectory, making it one of the most pressing public health challenges of the 21st century. Based on data from the Global Burden of Disease (GBD) 2021, it is estimated that 1.68 billion individuals globally live with musculoskeletal conditions, representing a 95% increase in prevalence since 1990 (GBD 2021 Low Back Pain Collaborators, 2023; Liu et al., 2022). This group of diseases now consistently ranks first as the leading cause of Years Lived with Disability (YLDs) worldwide, surpassing cardiovascular diseases and chronic respiratory disorders in terms of long-term functional disability (GBD 2021 Osteoarthritis Collaborators, 2023; Gill et al., 2023). This morbidity burden is not evenly distributed; populations in low- and middle-income countries (LMICs) bear a disproportionate share due to rapid demographic transitions toward aging populations, the dominance of manual physical labor sectors, and healthcare systems that are not yet fully structured to handle degenerative chronic diseases (Chu et al., 2020). At the Southeast Asian regional level, the burden of MSDs continues to increase, driven by lifestyle changes and the intensity of agricultural activities as well as massive industrialization (Akbar et al., 2023; Sananta et al., 2022).

Previous research has identified that the landscape of orthopedic services in Indonesia is marked by extremely unequal distribution of resources. A macro evaluation of healthcare workers in Indonesia reveals that the current ratio of healthcare workers is only 3.84 per 1,000 population, far below the World Health Organization (WHO) recommended threshold of 4.45 (Muharram et al., 2024). This inequality is most evident in the distribution of specialist doctors, including orthopedic and traumatology specialists, where the Gini Index between districts remains high at 0.53 (Muharram et al., 2024). This indicates an excessive concentration of orthopedic surgical expertise in major cities and provincial capitals, while remote, border, and island areas (DTPK) experience an absolute deficit (Mulyanto, Kunst, & Kringos, 2019). This disparity directly impacts the high referral rates from primary healthcare facilities to tertiary referral hospitals, which are often inefficient and cause delays in definitive treatment, as noted regarding the surgical referral system in LMICs (Pittalis, Brugha, & Gajewski, 2019). On the other hand, the economic burden of MSDs, particularly work-related low back pain (LBP), is massive; the economic loss due to occupational ergonomics in Indonesia reaches nearly 50 billion per year, with a heavier impact felt in provinces with low to middle GDP (Kadir et al., 2026).

Although the narrative regarding unequal access and the high burden of MSDs at the national level has been established, there is a crucial knowledge gap related to local epidemiology and patterns of clinical manifestation in frontline service facilities. A literature review shows that most orthopedic epidemiological studies in Indonesia come from tertiary academic hospitals on the island of Java, which inherently have a referral bias (more complex cases) and do not represent the actual community disease burden. Very few researchers focus their studies on the spectrum of musculoskeletal disorders in class D hospitals in remote areas. There has not yet been a comprehensive study that directly maps the distribution of diagnoses, trauma versus non-trauma etiology, and orthopedic referral patterns in remote hospitals as a basis for evaluating evidence-based health service planning. The absence of precise local data hinders policymakers in formulating strategies for the equitable distribution of specialist doctors, procurement of orthopedic surgical instruments, and strengthening of the referral system in the region.

Therefore, this research has a strong rationale for being conducted, particularly in North Morowali Regency, Central Sulawesi. North Morowali represents a microcosm of Indonesia's socio-economic transition; this region is driven by the traditional agriculture sector, which has historically been labor-intensive, and is now undergoing an rapid socioeconomic transformation with the presence of the global-scale nickel mining and refining industry (Reza et al., 2025). Both of these sectors have extreme ergonomic risks, leading to a high incidence of Work-Related Musculoskeletal Disorders (WMSDs) (Rabiei et al., 2021; Weston, Nasarwanji, & Pollard, 2016). This socioeconomic transition has

also created a distinctive demographic profile, where an expanding workforce of young and middle-aged industrial miners coexists with an older local agrarian population. Consequently, the region is expected to experience a dual burden of musculoskeletal disorders, with work-related conditions affecting the economically active population and degenerative disorders remaining prevalent among older residents. Amidst the high physical workload of the community, RS Pratama Mayapuria serves as the first referral facility mandated by the Minister of Health Regulation (Permenkes) No. 24 of 2014 to serve hard-to-reach areas (Ministry of Health of the Republic of Indonesia, 2014). However, with the limitations of advanced diagnostic support tools and the absence of full-time orthopedic specialists, this hospital faces a clinical burden that has the potential to exceed its structural capacity. Describing the spectrum of cases handled by RS Pratama Mayapuria will provide a much-needed portrait of clinical reality to guide the reform of primary and secondary healthcare services.

The main objective of this study is to describe the spectrum of musculoskeletal disorders as a basis for evaluating the need for orthopedic services at RS Pratama Mayapuria, North Morowali. The specific objectives include identifying patient demographic characteristics, mapping the distribution of clinical diagnoses and anatomical locations, determining the proportion of trauma versus non-trauma etiology, and analyzing the clinical disposition outcomes of patients (referral rates). Based on the demographic and occupational characteristics of North Morowali, this study was expected to identify a predominance of chronic degenerative musculoskeletal disorders and work-related musculoskeletal conditions, together with a substantial referral burden reflecting the limited availability of orthopedic services in this rural hospital.

METHOD

Study Design

This research is an observational epidemiological study with a retrospective descriptive design. This design was chosen because it allows for a comprehensive mapping of the actual disease burden recorded in the healthcare system without clinical intervention, thereby producing a valid real-world data portrait for health system planning analysis. The preparation of this manuscript strictly follows the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines to ensure transparency, validity, and reproducibility of the observational study reporting methodology.

Study Setting

The research was conducted at RS Pratama Mayapuria, located in North Morowali Regency, Central Sulawesi Province, Indonesia. RS Pratama Mayapuria is classified as a Class D Hospital. Based on national regulations, hospitals with the nomenclature "Pratama" are specifically designed as primary healthcare facilities and initial referral centers built in underdeveloped, border, and island areas, or areas that do not yet have adequate hospitals (Ministry of Health of the Republic of Indonesia, 2014). This hospital plays a crucial role as the primary gatekeeper for basic surgical and non-surgical emergency services before patients are referred to secondary or tertiary facilities (Ministry of Health of the Republic of Indonesia, 2014). Data collection covers a two-year consecutive clinical observation period, from January 1, 2024, to December 31, 2025. During the study period, musculoskeletal diagnostic services were supported by conventional plain radiography (X-ray). Advanced imaging modalities, including computed tomography (CT) and magnetic resonance imaging (MRI), were not available at the hospital. Accordingly, musculoskeletal diagnoses were established based on clinical history, physical examination, and plain radiographic findings when clinically indicated. Patients requiring advanced imaging or specialized orthopedic evaluation beyond the hospital's diagnostic capacity were referred to secondary or tertiary healthcare facilities in accordance with the national referral system.

Population and Sampling

The target population in this study is all patients who visit the outpatient facilities (General Clinic/Basic Surgery) or emergency care facilities (Emergency Installation) at RS Pratama Mayapuria with primary complaints involving the musculoskeletal system. The sampling method used is total sampling (saturation sampling), where all medical records that meet the inclusion criteria during the study period are included in the analysis. This approach was chosen to eliminate selection bias and ensure that the calculated prevalence and distribution of diagnoses truly represent the total clinical burden of the hospital, rather than just an estimate from a sub-sample. Formal sample size calculation using epidemiological formulas is not necessary because this study is a census of the entire eligible clinical population within the specified time frame, ultimately resulting in a final size of 483 patients.

Inclusion and Exclusion Criteria

Inclusion criteria are strictly designed to filter the relevance and validity of cases: (1) Patients of all age groups and genders; (2) Have a working diagnosis or definitive diagnosis classified in the International Statistical Classification of Diseases and Related Health Problems, Tenth Revision (ICD-10) blocks M00-M99 (Diseases of the musculoskeletal system and connective tissue) or blocks S00-T98 (Injuries, poisoning, and certain other consequences of external causes specifically involving bones, joints, ligaments, or muscles); (3) Medical records contain complete demographic data, diagnosis, and follow-up records (clinical disposition). Exclusion criteria are established to avoid data distortion: (1) Medical records with incomplete or missing data (e.g., absence of specific anatomical location details or etiology); (2) Duplicate medical records (if a patient visited multiple times for the same musculoskeletal condition during the study period, only the first visit or the visit with a definitive diagnosis was counted as one incident case to avoid data inflation). However, if the same patient presented with a different musculoskeletal diagnosis representing a separate clinical condition (e.g., osteoarthritis followed by an acute fracture), each diagnosis was recorded as an independent incident case because the objective of the study was to describe the spectrum of musculoskeletal disorders rather than the number of unique patients; (3) Patients with musculoskeletal complaints proven to be secondary (referred pain) from major visceral, cardiovascular, or other systemic emergencies that are the primary focus of clinical management.

Variables and Measurement Instruments

Data extraction was conducted by reviewing the Hospital Management Information System (SIMRS) and physical medical record archives. The measurement instrument is a standardized data extraction form developed by the research team. The operational variables extracted include:

Demographics and Socioeconomics

Age (calculated in years at the time of visit, then categorized into <40 years, 40–59 years, and ≥60 years for the purpose of degenerative risk stratification); Gender (Male, Female); and Main Occupation (sociologically classified into Housewife, Retired/Unemployed, Farmer/Daily Laborer, Civil Servant/Private Employee, and Entrepreneur/Trader).

Clinical Characteristics

Specific Diagnosis (grouped into Osteoarthritis, Low back pain, Extremity fractures, Tendinitis, Soft tissue injury, Dislocation, and Musculoskeletal Tumor); Dominant Anatomical Location (Knee, Spine, Pelvis, Shoulder, Wrist/Hand, Ankle/Foot, Elbow); and Etiology Classification (defined dichotomously as Trauma including traffic accidents, work accidents, sports injuries, and falls and Non-trauma including pure degenerative processes, mechanical/ergonomic factors, overuse syndrome, and neoplasms).

Follow-up/Outcome Measures

The final clinical disposition status of patients from the Emergency Department or Outpatient Clinic, categorized as "Definitively Managed" (including conservative management, ongoing outpatient care, medication, splinting, and basic physiotherapy education) and "Referred" (patients transferred to secondary or tertiary advanced healthcare facilities due to the need for definitive orthopedic surgical intervention, advanced radiology facilities, or specialized inpatient care exceeding the competency capacity of Primary Healthcare Centers).

Statistical Analysis

Statistical analysis was conducted using the Statistical Package for the Social Sciences (SPSS) version 26.0 (IBM Corp., Armonk, NY, USA). In accordance with the descriptive design of the study, the data were quantified using relevant parametric and non-parametric descriptive statistics. Categorical variables (such as gender, age group, type of occupation, diagnosis, and referral status) are presented in the form of absolute frequency distribution (n) and relative percentage (%). Quantitative data are presented using proportions to identify dominant patterns in the disease spectrum. Because the primary objective of this research is burden of disease mapping rather than comparative analytical hypothesis testing, bivariate or multivariate analyzes that produce p-values, confidence intervals (CIs), or effect sizes were not extensively conducted; the focus was maintained on the strength of the epidemiological narrative representing pre-test probabilities in the remote clinical population.

Ethical Clearance

This research protocol is conducted in full compliance with the bioethical principles outlined in the Declaration of Helsinki. Research implementation permission (Ethical Clearance) and administrative approval were obtained from the regional Health Research Ethics Committee and the management of RS Pratama Mayapuria before the data extraction process began. Considering the purely retrospective nature of the study using aggregated and anonymized medical record data (without traceable personal identities), the ethics committee granted a waiver of the requirement for direct informed consent from the patients. All data is managed with strict medical data security protocols to ensure the privacy of research subjects.

RESULTS

A total of 483 patients who met the inclusion criteria were identified and their data extracted during the observation period from January 2024 to December 2025 at RS Pratama Mayapuria. The analysis of patient profiles yielded highly distinctive demographic, clinical, and anatomical findings, providing a comprehensive view of the reality of musculoskeletal burden in the region.

The demographic distribution shows a marked predominance in age and gender. Female patients overwhelmingly dominate with a proportion of 71.2% (n=344), while males only represent 28.8% (n=139) of the total orthopedic visits. Stratification by age confirms that this facility is facing a geriatric morbidity crisis; more than half of the patients (50.5%, n=244) are aged ≥60 years. Middle-aged patients (40–59 years) formed the second largest group at 38.3% (n=185), while the young and productive population (<40 years) was comparatively very small with a proportion of 11.2% (n=54). Socioeconomically, Housewives are the group of patients who most frequently seek medical assistance, accounting for 38.3% (n=185) of the total cases. Workers in the manual physical sector, such as Farmers and Daily Laborers, also made a significant contribution of 15.3% (n=74). Complete demographic characteristics are presented in Table 1.

Table 1. Demographic Characteristics of Patients with Musculoskeletal Disorders (N=483)

Variable	n	%
Gender		
Female	344	71.2%
Male	139	28.8%
Age Group		
< 40 years	54	11.2%
40 – 59 years	185	38.3%
≥ 60 years	244	50.5%
Occupation		
Housewife	185	38.3%
Retired / Unemployed	108	22.4%
Farmer / Daily Laborer	74	15.3%
Employee (Civil Servant / Private Sector)	61	12.6%
Entrepreneur / Trader	55	11.4%

(Source: Medical records of RS Pratama Mayapuria, January 2024–December 2025)

The analysis of the clinical spectrum shows that the disease burden is driven by chronic degenerative pathology. Osteoarthritis (OA) is the most common absolute diagnosis, established in almost half of all patients (48.2%, n=233). The second most common diagnosis is Low back pain (LBP), which encompasses a spectrum from non-specific mechanical back pain to suspected disk herniation, affecting 24.2% (n=117) of patients. Major trauma cases confirmed radiologically, such as extremity fractures, accounted for 10.1% (n=49) of visits. Soft tissue conditions such as tendinitis and muscle injuries account for approximately 13% of the case combination. The incidence of confirmed neoplasms is very rare (1.0%, n=5) but presents as a clinical entity that requires vigilance (Table 2).

Table 2. Distribution of Musculoskeletal Clinical Diagnosis

Diagnosis	n	%
Osteoarthritis	233	48.2%
Low back pain	117	24.2%
Extremity fractures	49	10.1%
Tendinitis	36	7.5%
Soft tissue injury	27	5.6%
Dislocation	16	3.3%
Musculoskeletal tumor	5	1.0%

(Source: Medical records of RS Pratama Mayapuria, January 2024–December 2025)

In line with the high prevalence of OA and LBP, anatomical pathology mapping confirms that the knee is the joint bearing the highest morbidity burden, accounting for 40.8% (n=197) of all patient complaints. The spinal area, which correlates with LBP findings, ranks second with 24.8% (n=120) of cases. The main joints with high mobility and load, namely the hip and shoulder, collectively contribute around 20% (Table 3).

Table 3. Distribution Based on Main Anatomical Location

Anatomical Location	n	%
Knee	197	40.8%
Spine	120	24.8%
Hip	52	10.8%
Shoulder	48	9.9%

Anatomical Location	n	%
Wrist/hand	29	6.0%
Ankle/foot	21	4.3%
Elbow	16	3.3%

(Source: Medical records of RS Pratama Mayapuria, January 2024–December 2025)

The etiological classification outlines the root causes of the spectrum of diagnoses. The data clearly show the supremacy of long-term pathomechanical factors. Incidents due to non-trauma factors, which are intrinsically closely related to progressive cellular degeneration, mechanical overload, and repetitive use (overuse), recorded a massive percentage of 79.9% (n=386). On the other hand, cases caused by high or low energy acute trauma (such as traffic accidents, mining incidents, or falls) account for less than one-fifth of the total clinical load, which is 19.1% (n=92) (Table 4).

Table 4. Case Classification Based on Etiology

Etiology	n	%
Non-trauma (Degenerative, Mechanical, Overuse)	386	79.9%
Trauma (Accident, Sports, Fall)	92	19.1%
Neoplasm (Primary/Metastatic Tumor)	5	1.0%

(Source: Medical records of RS Pratama Mayapuria, January 2024–December 2025)

From the perspective of healthcare service operations, the endpoint of the clinical pathway for patients in the emergency department and outpatient care provides a sharp indicator of the capacity of RS Pratama Mayapuria. As many as 61.9% of patients (n=299) were definitively managed on-site thru conservative management (medication, education, activity modification). However, a very high proportion, namely 38.1% (n=184) of the total musculoskeletal patients, could not be systematically managed and had to be referred to secondary or tertiary level healthcare facilities (Table 5).

Table 5. Distribution Based on Follow-Up Status and Referral

Follow-Up / Clinical Disposition	n	%
Definitive Management (Conservative / Outpatient)	299	61.9%
Referred to advanced healthcare facilities	184	38.1%

(Source: Medical records of RS Pratama Mayapuria, January 2024–December 2025)

Based on the above epidemiological findings, an applied needs analysis can be extrapolated. The high prevalence of knee osteoarthritis (OA) indicates a gap in services for integrated degenerative joint management. The LBP figures indicate the need for medical rehabilitation infrastructure. Meanwhile, 49 cases of fractures and 16 cases of dislocations, although their percentages are smaller, are classified as orthopedic functional emergency entities that require the availability of internal fixation surgical instruments (Open Reduction Internal Fixation/ORIF) and intraoperative fluoroscopy imaging modalities (C-arm), which are currently not fully met in the rural areas.

DISCUSSION

This study presents the first comprehensive musculoskeletal epidemiological mapping at the Pratama Hospital in the North Morowali region. Analysis of 483 patient cohorts during the 2024-2025 period revealed that the spectrum of grassroots orthopedic morbidity is predominantly characterized by chronic degenerative conditions, with Osteoarthritis (OA) (48.2%) and Low Back Pain (LBP) (24.2%) being the main etiologies manifesting most strongly in the knee compartment (40.8%) and the spine (24.8%). This phenomenon primarily affects the geriatric group (50.5%) and women (71.2%). In

addition, a consistent burden of acute trauma injuries was detected (19.1%), which collectively led to the most significant finding from a hospital management perspective: a referral rate exceeding 38.1%, a percentage far beyond the physiological referral margin for a district hospital, directly highlighting the reflects the limited definitive treatment capacity at the primary referral level.

Demographic findings in this cohort, particularly the dominance of elderly female patients suffering from knee OA, show a strong concordance with the current global literature. The GBD 2021 Consortium globally highlights that the incidence and prevalence of OA increase exponentially with age and have a clear gender bias toward women, making it a major contributor to YLDs in the elderly population (GBD 2021 Osteoarthritis Collaborators, 2023). Recently published national data affirm that the prevalence of gonarthrosis in Indonesia can reach 15.0%, with the risk (odds ratio) sharply increasing in postmenopausal women, consistent with what was observed in this study (Kurniari et al., 2025).

Interestingly, the high percentage of the "Housewife" group (38.3%) and farmers/laborers (15.3%) in this cohort opens a socio-cultural discourse on disease determinants. In rural and remote areas of Indonesia, the nomenclature "Housewife" often obscures the extreme daily physical workload including heavy lifting, repetitive squatting (when washing or cooking traditionally), and informal involvement in the agricultural sector (Akbar et al., 2023). This is evidenced by research reporting that the prevalence of WMSDs among farmers in Southeast Asia can reach very concerning levels, triggered by awkward postures and the absence of ergonomic equipment (Akbar et al., 2023). Beyond occupational exposure, healthcare-seeking behavior may also contribute to this finding. Elderly women living in rural communities often encounter barriers to timely healthcare access, including geographical constraints, financial dependence, limited transportation, and the tendency to prioritize family responsibilities over their own health. Consequently, degenerative musculoskeletal conditions such as knee osteoarthritis may only come to medical attention after symptoms have progressed sufficiently to interfere with daily activities. Although these factors were not directly evaluated in the present study, they may partially explain the high proportion of elderly housewives seeking care at our hospital. Furthermore, the constellation of LBP diagnoses at 24.2% directly correlates with the economic characteristics of North Morowali, which is currently undergoing an aggressive transition toward becoming the national epicenter of nickel mining (Reza et al., 2025). Recent studies convincingly measure the economic impact of occupational back pain in Indonesia, asserting that LBP among blue-collar workers in the mining industry area poses a major threat to productivity and triggers massive welfare loss at the regional level (Kadir et al., 2026).

Macro-systemically, the high rate of orthopedic patient referrals (38.1%) from RS Pratama Mayapuria directly validates the warnings of global health experts regarding the inefficiency of surgical referral architecture in LMICs. The referral burden observed in this study should also be interpreted within the geographical context of North Morowali. In routine clinical practice, most patients requiring orthopedic specialist care are referred to RSUD Luwuk in Banggai Regency, the nearest hospital providing orthopedic specialist services, which requires approximately five hours of overland travel from RS Pratama Mayapuria. Patients requiring more complex orthopedic procedures may subsequently be referred to tertiary hospitals in Palu or Makassar. These inter-regional referral pathways frequently involve prolonged travel over considerable distances, creating additional logistical, financial, and physical burdens for patients and their families, particularly those with fractures, dislocations, or other time-sensitive musculoskeletal conditions. A systematic review confirms that the absence of basic surgical infrastructure, the limited availability of fixation instruments, and the deficit of trained medical personnel in district hospitals lead to an unreasonable exodus of trauma and elective surgical patients to tertiary facilities (Pittalis, Brugha, & Gajewski, 2019; Stewart et al., 2016). This situation exacerbates the phenomenon of caseload accumulation in provincial centers and confirms the analysis regarding the Indonesian Gini Index for specialists reaching 0.53, indicating the structural inability of the country to ensure equitable access to orthopedic specialist services for rural communities (Muharram et al., 2024).

From a pathophysiological and biomechanical perspective, the dominance of knee OA in geriatric women and LBP in manual workers in North Morowali can be explained thru the pathomechanical cascade mechanism. Estrogen deficiency in postmenopausal women eliminates the anabolic effects on chondrocytes, triggering the up-regulation of matrix degradation enzymes (matrix metalloproteinases/MMPs) and pro-inflammatory cytokines (IL-1β, TNF-α) that damage type II collagen in the hyaline cartilage matrix (Sananta et al., 2022). Biomechanically and anatomically, women tend to have a wider pelvis, which increases the degree of the Quadriceps angle (Q-angle). This increase in the Q-angle distorts the force vectors on the patellofemoral and medial tibiofemoral compartments. When this biomechanical vulnerability is combined with agricultural or domestic overuse loads, focal mechanical stress rapidly exacerbates subchondral sclerosis and osteophyte formation. On the other hand, the pathogenesis of LBP in miners is driven by whole-body vibration from heavy machinery and repetitive axial loading. Persistent compressive forces and shear forces trigger material fatigue in the annulus fibrosus, causing microtears, dehydration of the nucleus pulposus, and atrophy of the multifidus paraspinal muscles, which anatomically lead to chronic spinal instability and facet arthropathy (Kadir et al., 2026; Rabiei et al., 2021).

The findings of this study have important implications for strengthening musculoskeletal services at rural Class D hospitals. The predominance of osteoarthritis and low back pain indicates the need to strengthen conservative musculoskeletal care through improved diagnostic support, evidence-based non-operative management, rehabilitation services, and standardized referral pathways. The occurrence of acute traumatic injuries also highlights the importance of strengthening the capacity of primary care physicians in the initial assessment and stabilization of orthopedic trauma. Furthermore, the substantial orthopedic referral rate observed in this study supports strengthening regional orthopedic service networks and informing orthopedic workforce planning to improve access to specialist care for underserved populations, while maintaining definitive orthopedic surgical management at secondary and tertiary referral hospitals.

The main strength of this epidemiological study lies in the precision of its data collection at the peripheral community level. Unlike previous literature that used secondary data from medical records of primary referral hospitals in provincial centers which are inherently filled with selection bias because mildly conservative patients never reach those facilities this study presents an original, absolute, and unfiltered portrait of the actual musculoskeletal burden on agrarian-industrial grassroots communities. This increases the external validity of the study to be extrapolated rural regions with similar characteristics throughout Indonesia.

Although descriptively valid, this study is not free from inherent limitations. The retrospective design introduces vulnerability to missing data and potential misclassification arising from inconsistencies in diagnostic coding within the hospital information system (SIMRS). Although diagnoses were extracted from medical records, variations in coding practices may have resulted in some musculoskeletal conditions being categorized under broader diagnostic labels, potentially affecting the precision of disease classification. Moreover, the clinical reality of a class D hospital limits the diagnostic process to anamnesis, physical examination, and conventional radiography (X-ray). The absence of Magnetic Resonance Imaging (MRI) modalities means that many anatomically specific pathologies, such as meniscal tears or degrees of radicular compression in HNP, must be generalized under the umbrella of broader diagnoses (knee pain or non-specific LBP), which potentially oversimplifies the complexity of the actual soft tissue pathologies.

Future research directions should bridge the gap between epidemiological descriptions and functional intervention evaluations. Future research needs to use prospective and multicenter designs, measuring PROMs scores (such as the WOMAC instrument for OA or the Oswestry Disability Index for LBP) longitudinally in this population before and after specific interventions. Critical implementation science research is also needed to measure the cost-effectiveness analysis of the program for the rotational deployment of senior orthopedic surgery residents (chief residents) to Pratama hospitals,

supported by telementoring infrastructure, to assess how significantly the intervention can reduce referral curves and improve service utility.

CONCLUSION

The spectrum of musculoskeletal disorders at RS Pratama Mayapuria was predominantly characterized by chronic degenerative conditions, particularly osteoarthritis and low back pain, with a smaller but clinically important proportion of acute traumatic injuries. This pattern reflects the demographic transition toward an aging population together with the occupational characteristics of North Morowali, where agricultural activities and the expanding nickel mining industry expose the population to substantial biomechanical demands. The high orthopedic referral rate (38.1%) further highlights the limited capacity of rural primary hospitals to provide comprehensive musculoskeletal care and underscores persistent disparities in access to orthopedic services across geographically underserved regions of Indonesia.

These findings provide important evidence for regional health service planning. Rather than expanding advanced orthopedic surgical capability at the primary hospital level, priority should be given to strengthening conservative musculoskeletal care through improved diagnostic support, rehabilitation and physiotherapy services, evidence-based non-operative management, and training of primary care physicians in basic orthopedic trauma assessment and stabilization. At the health system level, the substantial referral burden observed in this study supports regional orthopedic workforce planning, including expanded access to orthopedic expertise through outreach services, teleconsultation, and equitable specialist distribution, while maintaining efficient referral pathways for patients requiring definitive orthopedic surgery at secondary and tertiary referral hospitals.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

ACKNOWLEDGMENTS

The authors thank the management and medical record department of Rumah Sakit Pratama Mayapuria for their administrative and technical support during the data collection process.

PATIENT CONSENT STATEMENT

Patient consent was waived by the institutional ethics committee due to the retrospective nature of this study and the use of anonymized medical record data.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

GENERATIVE AI STATEMENT

The authors used Gemini AI (Gemini 3.1 Pro Deep Research) to improve the grammar and clarity of the manuscript. All content, data interpretations, and clinical implications were critically reviewed and approved by the authors.

LIST OF ABBREVIATIONS

GBD : Global Burden of Disease
LBP : Low Back Pain
LMICs : Low- and Middle-Income Countries
MSDs : Musculoskeletal Disorders
OA : Osteoarthritis
ORIF : Open Reduction and Internal Fixation
PROMs : Patient-Reported Outcome Measures
TKA : Total Knee Arthroplasty
WMSDs : Work-Related Musculoskeletal Disorders

PUBLISHER'S NOTE

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